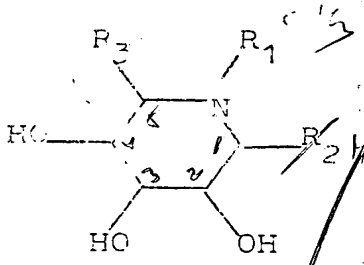
WHAT IS CLAIMED IS:

1. A compound which is a 3,4,5-trihydroxypiperidine of the following general formula or its pharmaceutically acceptable bioprecursor:



I

in which

R_1 and R_3 are the same or different and each is H or an optionally substituted, straight-chain, branched or cyclic saturated or unsaturated aliphatic hydrocarbon radical or an optionally substituted aromatic or heterocyclic radical, and

R_2 is -H, -OH, -OR', -SH, -SR', $-NH_2$, -NHR', $-NR'R''$, $-NH-CH_2-$, $-NR'-CH_2-$, $-NR'R''-CH_2-$, -COOH, -COOR', $HO-CH_2-$, $R'CO-NHCH_2-$, $R'CO-NR''CH_2-$, $R'SO_2-NHCH_2-$, $R'SO_2-NR''CH_2-$, $R'-NH-\overset{\overset{O}{\|}}{C}-NH-CH_2-$, $R'-NH-\overset{\overset{S}{\|}}{C}-NH-CH_2-$, $R'-O-\overset{\overset{O}{\|}}{C}-NH-CH_2-$, $-SO_3H$, -CN, $-CONH_2$, -CONHR' or -CONR'R", wherein

R' and R" are the same or different and each has any of the meanings given above for R_1, provided that when R_3 is $-CH_2OH$ and R_2 is H or OH; R_3 is H and R_2 is H, OH, SO_3H, -CN or CH_2-NH_2; or R_3 is $-CH_2-NH_2$ and R_2 is OH, then R_1 is other than hydrogen.

2. A compound according to claim 1, in which R_1, R' and R'' are the same or different and each is alkyl having from 1 to 30 C atoms, alkenyl or alkinyl having from 2 to 18 C atoms, a monocyclic, bicyclic or tricyclic radical having from 3 to 10 C atoms, which is saturated, mono-unsaturated or di-unsaturated, aryl having 6 or 10C atoms, or a heterocyclic radical having from 3 to 8 ring members which contains 1, 2, 3 or 4 heteroatoms and to which a benzene ring or a further said heterocyclic radical can be fused, each of the above groups being optionally substituted by from 1 to 5 substituents.

3. A compound according to claim 1 or claim 2 in which R_1 is -H, $-CH_3$, $-CH_2OH$, $-CH_2-NH_2$, NHR'-CH_2-, NR'R''-CH_2-, R'CONH-CH_2-, R'CO-NR''CH_2-, Hal-CH_2-, R'O-CH_2-, R'$COOCH_2$-, R'SO_2O-CH_2-, R'SO_2NHCH_2-, R'SO_2-NR''CH_2-, R'NH-CO-NH-CH_2-, R'NHCS-NH-CH_2-, R'O-CO-NH-CH_2-, -CN, -COOH, -COOR', -$CONH_2$, -CONHR' or -CONR'R'' wherein R' and R'' are the same or different and each has any of the meanings given above for R_1.

4. A compound according to claim 1 in which R_2 is -H, -OH, $-SO_3H$, -CN, $-CH_2NH_2$, $-CH_2NH$-[C_1 to C_{14}-alkyl], $-CH_2NH-\overset{\overset{O}{\|}}{C}$-[$C_1$ to C_{14}-alkyl], $-CH_2$-NH-SO_2-[C_1 to C_{14}]-alkyl $-CH_2$-NH-SO_2-phenyl, $-CH_2-NH-\overset{\overset{O}{\|}}{C}$-phenyl, $-CH_2-NH-\overset{\overset{O}{\|}}{C}-NH$[$C_1$ to C_{14}-alkyl), $-CH_2-NH-\overset{\overset{O}{\|}}{C}-NH$-phenyl, $-CH_2-NH-\overset{\overset{S}{\|}}{C}-NH$[$C_1$ to C_{14}-alkyl), $-CH_2-NH-\overset{\overset{S}{\|}}{C}-NH$-phenyl, $-CH_2-NH-\overset{\overset{O}{\|}}{C}-O-$[$C_1$ to C_{14}-alkyl] or $-CH_2-NH-\overset{\overset{O}{\|}}{C}-O$-phenyl wherein phenyl is unsubstituted or substituted by methyl, ethyl, methoxy, ethyl, methoxy, chlorine, bromin or nitro.

5. A compound according to claim 1, in which R_2 is -H, $-SO_3H$ or -CN.

6. A compound according to claim 5 in which R_2 is -H.

7. A compound according to claim 1, in which R_3 is -H, $-CH_2OH$, $-CH_3$, $-CH_2NH_2$, $-CH_2-NH-(C_1$ to C_6-alkyl), $-CH_2NH-CO-(C_1$ to C_6 alkyl) or $CH_2-O-(C_1-C_6$-alkyl).

8. A compound according to claim 1 in which R_3 is $-CH_2OH$.

9. A compound according to claim 1 in which R_2 is hydrogen and R_3 is $-CH_2OH$.

10. A compound according to claim 1 which is N-methyl-1-nojirimycin, N-ethyl-1-nojirimycin, N-n-butyl-1-nojirimycin, N-benzyl-1-nojirimycin, N-allyl-1-nojirimycin, N-(2-methoxy-ethyl)-1-nojirimycin, N-methyl-1-desoxy-nojirimycin, N-ethyl-1-desoxynojirimycin, N-n-propyl-1-desoxy-nojirimycin, N-n-butyl-1-desoxy-nojirimycin, N-n-pentyl-1-desoxy-nojirimycin, N-n-hexyl-1-desoxynojirimycin, N-iso-butyl-1-desoxy-nojirimycin, N-benzyl-1-desoxynojirimycin, N-allyl-1-desoxy-nojrimycin, N-(2-methoxyethyl) 1-desoxynojirimycin, N-methyl-1-desoxynojirimycin-1-sulphonic acid, N-octyl-1-desoxynojirimycin, N-nonyl-1-desoxy-nojirimycin, 1-tosylaminomethyl-1-desoxynojirimycin, N-methyl-1-tosylaminomethyl-1-desoxynojirimycin, N-nonyl-1-acetylaminomethyl-1-desoxynojirimycin, N-benzoyl-1-benzoylaminomethyl-1-desoxynojirimycin, N-propargyl-

dexosynojirimycin or N-(2-methylmercaptoethyl)-1-desoxy-nojirimycin.

11. A compound of claim 1 which is N-(n-Heptyl)-1-desoxynojirimycin.

12. A compound of claim 1 which is N-Methyl-1-desoxynojirimycin.

13. A compound of claim 1 which is N-Ethyl-1-desoxynojirimycin.

14. A compound of claim 1 which is N-Benzyl-1-desoxynojirimycin.

15. A compound of claim 1 which is N-(n-Butyl)-1-desoxynojirimycin.

16. A compound of claim 1 which is N-(β-Hydroxy-ethyl)-1-desoxynojirimycin.

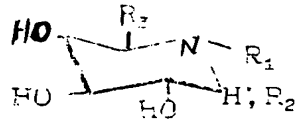
17. A compound according to claim 1 other than said bioprecursors in which

R_1 is an optionally substituted straight-chain, branched or cyclic saturated or unsaturated aliphatic hydrocarbon radical or an optionally substituted aromatic or heterocyclic radical and

R_2 is H, OH, alkoxy, amino, monoalkylamino or dialkylamino, $-SO_3H$ or -CN, and

R_3 is CH_2OH.

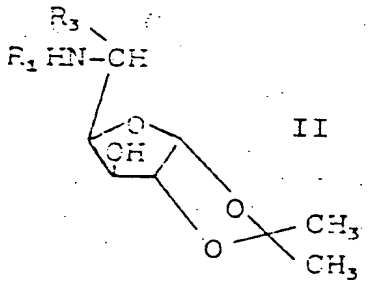
~~18.~~ 17 A compound according to claim ~~1 other than said bioprecursors~~ 16 which has the steric formula



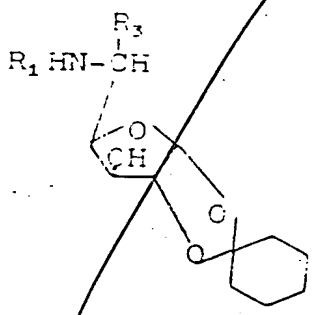
~~wherein~~

~~R_1, R_2 and R have the same meaning as defined hereinbefore.~~

19. A process for the production of a compound according to claim 1 which comprises subjecting to hydrolysis a compound of the general formula II or IIa



II



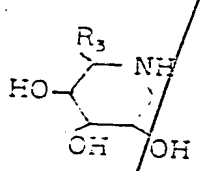
IIa

in which

R_1 and R_3 have the same meaning as defined hereinbefore in claim 1, formula I,

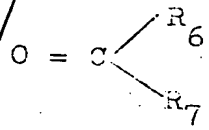
a) so as to remove the isopropylidene or cyclohexylidene protective group; or

b) which comprises reacting, when R_2 is hydrogen, a compound of the general formula V



V

wherein R_3 has the same meaning as defined hereinbefore in claim 1, formula I, with a carbonyl compound of the general formula VI



VI

in which

R_6 and R_7 are the same or different and each has the same meaning as indicated above for R_1 or R_6 and R_7 are members of an alicyclic or heterocyclic ring,

in the presence of a hydrogen donor reducing agent, or

c) which comprises reacting, when R_2 is hydrogen and R_1 is alkyl having the same meaning as in claim 1, formula I hereinabove,

with a reactive alkylating agent of the general formula IX

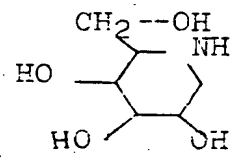
$$Z - R_1 \qquad \text{IX}$$

in which

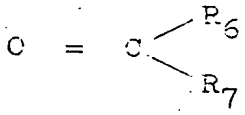
R_1 has the same meaning as defined immediately hereinbefore and

Z is an easily eliminated leaving group which is customary in alkylating agents.

20. A process for the production of a compound according to claim 17 in which compound R_2 is hydrogen, which comprises reacting a compound of the formula



a) with a carbonyl compound of the formula VI



VI

in which

R_6 and R_7 are the same or different and each is hydrogen or has the same meaning as indicated above for R_1 or R_6 and R_7 are members of an alicyclic or heterocyclic ring,

in the presence of a hydrogen donor reducing agent, or

b) with a reactive alkylating agent of the general formula IX

$$Z - R_1 \qquad \text{IX}$$

in which

R_1 has the same meaning as defined immediately hereinbefore, and

Z is an easily eliminated leaving group which is customary in alkylating agents.

21. A process according to claim 19 a) in which the reaction is carried out at from ambient temperature to the reflux temperature of the reaction medium.

22. A process according to claim 19 b) in which the reaction is carried out at from ambient temperature to the reflux temperature of the reaction medium.

23. A process according to claim 19 in which the reaction is carried out in the presence of an inert solvent.

24. A pharmaceutical composition containing as an active ingredient an effective amount of a compound according to claim ~~1~~ 47 in admixture with a solid or liquefied gaseous diluent or in admixture with a liquid diluent other than a solvent of a molecular weight less than 200 except in the presence of a surface-active agent.

25. A pharmaceutical composition containing as an active ingredient an effective amount of a compound according to claim ~~1~~ 47 in the form of a sterile or physiologically isotonic aqueous solution.

~~26.~~ 20 A composition according to claim ~~24~~ 18 or ~~25~~ 19 containing from 0.5 to 95% by weight of the said active ingredient.

27. A medicament in dosage unit form comprising an effective amount of a compound according to claim ~~1~~ 47 and an inert pharmaceutical carrier.

~~26.~~ 22 A medicament of claim ~~27~~ 21 in the form of tablets, pills, dragees, capsules, ampoules, or suppositories.

29. A method of combating adiposity, diabetes and/or ~~hypercipaemia~~ hyperlipaemia in warm-blooded animal which comprises administering to the said animal an effective amount of an active compound according to claim ~~1~~ 47 either alone or in admixture with a diluent or in the form of a medicament.

~~30.~~ 28 A method according to claim ~~29~~ 27 in which the active compound is administered in an amount of 0.01 mg to 100 mg per kg body weight per day.

~~31.~~ 29 A method according to claim ~~30~~ 28 in which the animal is a ruminant.

~~32.~~ 30 A method according to claim ~~29~~ 27 in which the active compound is administered orally.

33. An animal feedstuff which contains an effective amount of an active compound according to claim ~~1~~ 47 either alone or in admixture with a diluent.

34. A pharmaceutical composition containing as an active ingredient an effective amount of a compound according to claim ~~17~~ 18 in admixture with a solid or liquefied gaseous diluent or in admixture with a liquid diluent other than a solvent of a molecular weight less than 200 except in the presence of a surface-active agent.

35. A pharmaceutical composition containing as an active ingredient an effective amount of a compound according to claim ~~17~~ 18 in the form of a sterile or physiologically isotonic aqueous solution.

36. A medicament in dosage unit form comprising an effective amount of a compound according to claim ~~17~~ 18 and an inert pharmaceutical carrier.

~~37.~~ 36 A medicament of claim ~~36~~ 25 in the form of tablets, pills, dragees, capsules, ampoules, or suppositories.

38. A method of combating adiposity, diabetes and/or hyperlipaemia in warm-blooded animals which comprises administering to the animals an effective amount of an active compound according to claim ~~17~~ 18 either alone or in admixture with a diluent or in the form of a medicament.

39. An animal feedstuff which contains an effective amount of an active compound according to claim 18 either alone or in admixture with a diluent.

40. A pharmaceutical composition containing as an active ingredient an effective amount of a compound according to claim 18 in admixture with a solid or liquefied gaseous diluent or in admixture with a liquid diluent other than a solvent of a molecular weight less than 200 except in the presence of a surface-active agent.

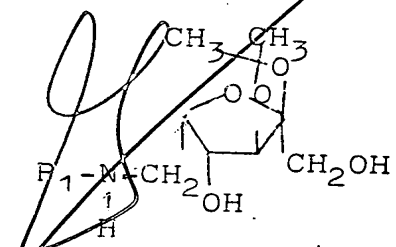
41. A pharmaceutical composition containing as an active ingredient an effective amount of a compound according to claim 18 in the form of a sterile or physiologically isotonic aqueous solution.

42. A medicament comprising an effective amount of a compound of claim 18 in the form of tablets, pills, dragees, capsules, ampoules, or suppositories.

43. A method of combating adiposity, diabetes and/or hyperlipaemia in warm-blooded animals which comprises administering to the animals an effective amount of an active compound according to claim 18 either alone or in admixture with a diluent or in the form of a medicament.

44. An animal feedstuff which contains an effective amount of an active compound according to claim 18 either alone or in admixture with a diluent.

45. A process for the production of a compound according to claim 1 which comprises hydrolyzing a compound of the general formula (XXI)



with strong mineral acid of pH 1 at -20 to +20°C and then hydrogenating the hydrolyzed product at pH 4 to 6 with H_2/Raney-Nickel, H_2/Pt O_2 or sodium borohydride.

15. A compound of claim 1 which is N-(5'-hydroxy-n-pentyl)-1-desoxynojirimycin.